Differences in the Price-Earning-Return Relationship between Internet and Traditional Firms

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ABSTRACT

This paper examines the effects of the beginning stock price and the current earnings on the stock returns and analyzes the differences in the price-earning-return (P-E-R) relationship between internet firms and traditional. Our results show that the stock returns are more affected by the previous mispricing than by the current performance, and that the previous mispricing has more effect on the internet stock returns than on the traditional stock returns, and suggest that internet stocks earn higher returns, despite of less earnings, than traditional ones because the internet firms are under-valued in the beginning price compared with the traditional ones.

1. INTRODUCTION

Before "internet bubbles" burst in the spring 2000, many new valuation measures for internet firms (IF) had popped up to justify the high prices of internet shares. According to Trueman, Wong and Zhang (2000) (TWZ), the fundamental reason why different methods came into exist to value IF is that no historical financial information was useful to forecast future performance of these firms because the industry was so young and growing so fast.

Now, more than 7 years have passed since internet bubbles burst, and most bubbles seem to disappear. In fact, according to TWZ, as of November 23, 1999, Yahoo! had a P/E of 1,382, eBay a P/E of 3,351, and Amazon.com traded at a multiple to sales revenue of 22.9 (it had been unprofitable since inception). However, as of the end of December, 2007, Yahoo! has a P/E of 46.9, eBay a P/E of 128.7, and Amazon.com trades at a multiple to sales revenue of 2.6 (it is profitable now, and its P/E is 81). Hence, it may be better than ever to compare IF with traditional firms (TF) by the same model.

In this research, we investigate, by using post-internet-bubble data, whether any significant differences exist in the price-earning-return (P-E-R) relationship between IF and TF. Our results show that the stock returns are more affected by the previous mispricing than by the current performance, and that the previous mispricing has more effect on the internet stock returns than on the traditional stock returns, and suggest that internet stocks earn higher returns, despite of less earnings, than traditional ones because the internet firms are under-valued in the beginning price compared with the traditional ones.

This paper contributes to the existing literature in the following distinct ways. First, few researchers have studied IF by using data after 2002, the year internet bubbles seemed to have gone. Second, we analyze residuals from the regressions to capture the detailed difference in the P-E-R relations between two types of firms, and introduce the expected return line (ERL) to draw the P-E-R relationship.

The remainder of this paper is organized as follows; the next section briefly reviews literatures and the third section explains the model and methodology. The fourth provides sample selection criteria and data, the fifth reports the results of the empirical tests and the final section concludes the paper.

2. LITERATURE REVIEW

Most papers examining the stock returns of IF, using data before 2002, do not find any significant P-E-R relationship since these researches mainly aimed at identifying factors other than financial information to explain IF valuation. At that time, researchers could not explain the P-E-R relationship of IF using traditional valuation methods, which rely on financial data. Furthermore, few researches have examined the P-E-R of IF using data after 2002, the year when the Internet bubble seemed to have disappeared.

In general, academicians and practitioners have found the P-E-R relations in seeking ability to predict stock returns; in general, the ratio of book value to market value (BM) describes mispricing in the beginning price, and either earnings yield (= earnings-price ratio = EP = EPS/Price, EPS = earnings per share) or PE multiple (= Price/EPS) explains the relationship between earnings and returns.

Jaffe, Keim, and Westerfield (1989) analyze the relation between stock returns and the effects of size and EP ratio and find the EP effect to be significant. Fama and French (1992) argue that two variables, size measured by the market value (MV) and the BM ratio, capture much of the average stock returns and also conclude that the EP is significant when it is the unique explaining variable for the stock returns, but its significance disappears when the BM ratio is also taken into account.

Pontiff and Schall (1998) find that the BM ratio provides some predictive ability, which stems from the relation between BV and future earnings. Kothari and Shanken (1997) find reliable evidence that the BM ratio track time-series variation in expected real stock returns for the US stock market, while Lamont (1998) argues that, the PE has independent predictive power for excess returns in addition to the dividend-price ratio.

Bae and Kim (1998), using a sample of Japanese firms, show that, compared with the trading strategy based on EP or BM alone, the trading strategy based on the combination of both EP and BM generates substantially higher returns, implying that BM (or EP) capture certain aspects of equity values that are not captured by EP (BM). The regression results further indicate

that the predictive ability of EP is dominated by that of BM, consistent with the US results of Fama and French (1992).

3. MODELS AND METHODOLOGY

3-1. P-E-R Relationship

Returns are calculated by the following formula.

$$R_{i,t} = \frac{D_{i,t} + P_{i,t} - P_{i,t-1}}{P_{i,t-1}} \quad (1)$$

Where $R_{i,t}$ is the return on stock i at year t,

$D_{i,t}$ is the dividends per share (DPS) for stock i at year t,

$P_{i,t}$ and $P_{i,t-1}$ is the price of stock i at year t and t-1.

In the most finance literatures, dividends and price are considered as the function of earnings.

$$D_{i,t} = d_i E_{i,t}$$

$$P_{i,t} = p_i E_{i,t}$$

Where $E_{i,t}$ is the earnings per share (EPS) for stock i at year t,

d_i is the dividend payout ratio (DE) = D/E,

p_i is the price-earning multiple (PE) = P/E.

Hence,

$$D_{i,t} + P_{i,t} = (d_i + p_i)E_{i,t}, \quad (2)$$

Substituting (2) into (1) yields

$$R_{i,t} = \frac{(d_i + p_i)E_{i,t} - P_{i,t-1}}{P_{i,t-1}}, \text{ then}$$

$$R_{i,t} = \frac{E_{i,t}}{P_{i,t-1}}(d_i + p_i) - 1. \quad (3)$$

The equation (3) shows the P-E-R relationship that stock returns are the function of the beginning price and the current EPS if d_i and p_i are assumed to be constant. In other words, there are two sources of the unexpected returns: mispricing in the previous year and unanticipated EPS in the current year, e.g., there would be positive (negative) unexpected returns if the stock is under (over)-valued in the previous year or if the firm is over (under)-performing in the current year.

In this paper, the comparison between IF and TF is relative, not absolute; for example, under-valued (performed, returned) internet stocks means over-valued (performed, returned) traditional ones, and vice versa. Because they are compared each other, one type should be better than the other, and vice versa, unless they are equal.

3-2. Models

To measure the P-E-R for each firm, we use the following regression models because PE multiple, profit margin (PM = EPS/SPS, SPS = sales per share) and β are widely used.

$$P_{i,t-1} = a + bE_{i,t-1} + v_{i,t-1} \quad (4)$$

$$E_{i,t} = m + nS_{i,t} + e_{i,t} \quad (5)$$

$$R_{i,t} = \alpha + \beta M_t + r_{i,t}\ ^{1} \quad (6)$$

Where $P_{i,t-1}$ is the price of stock i at year t-1 (beginning year),

$E_{i,t}$ and $E_{i,t-1}$ is the EPS of firm i at year t and t-1,

$S_{i,t}$ is the SPS of firm i at year t,

$R_{i,t}$ is the return on stock i at year t,

M_t is the market return at year t,

$a, b, m, n, \alpha, \beta$ are constant,

$v_{i,t-1}, e_{i,t}, r_{i,t}$ are the error terms.

The expected values for P-E-R are the fitted values from the regressions, and error terms, $v_{i,t-1}$, $e_{i,t}$ and $r_{i,t}$ are the unexpected portion of P-E-R for each stock. The stock with positive (negative) error terms is regarded as having higher (lower) value than expected, i.e., over (under)-valued, performing or returned.

To examine the P-E-R relationship and analyze the difference in this relationship between two types of firms, using the residuals from the models (4), (5) and (6), we regress $v_{i,t-1}$ and $e_{i,t}$ against $r_{i,t}$.

$$r_{i,t} = \gamma + \delta v_{i,t-1} + \lambda e_{i,t} \quad (7)$$

Where $r_{i,t}$ is the unexpected (portion of) returns on stock i at year t,

$v_{i,t-1}$ is the wrong-valued (portion of) price in the previous year (t-1),

$e_{i,t}$ is the unanticipated (portion of) EPS at year t,

γ, δ, λ are constant.

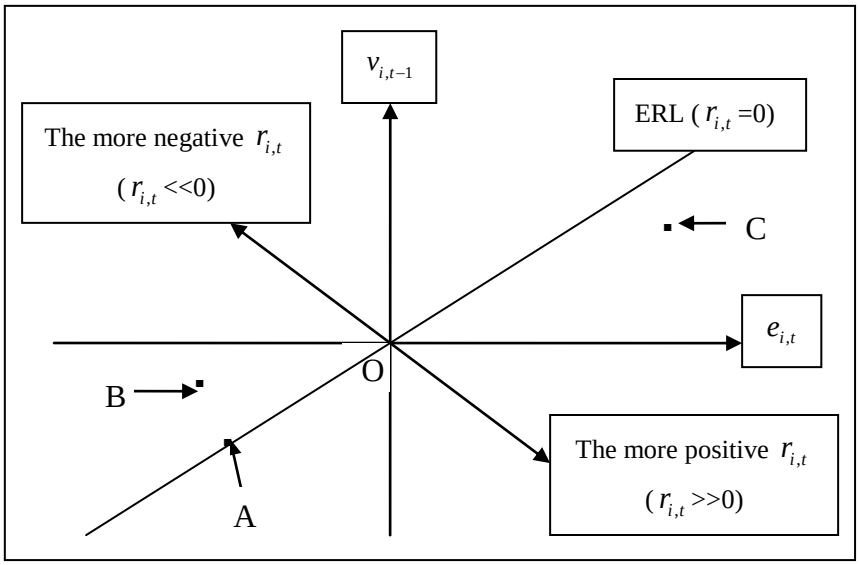
In addition to regressions, we perform the independent t-test to find whether any significant mean difference exists in the important variables such as $P_{i,t-1}, E_{i,t}, R_{i,t}, v_{i,t-1}, e_{i,t}$ and $r_{i,t}$ between IF and TF.

3-3. Expected Return Line

We analyze the residuals, $v_{i,t-1}$, $e_{i,t}$ and $r_{i,t}$, by the graph representing the P-E-R relationship. In [Figure 1], the expected return line (ERL) represents the firms whose stock returns are same as the expected returns from the model (6) ($r_{i,t}$ = 0). The slope of the ERL depends on the relative degree of effect between $v_{i,t-1}$ and $e_{i,t}$ on $r_{i,t}$. The lower (higher) the slope is, the stronger is the effect of $v_{i,t-1}$ ($e_{i,t}$). We can calculate the slope of the ERL in the following way. From the graph in [Figure 1], the ERL can be described by

$$v_{i,t-1} = \phi e_{i,t}, \quad (8)$$

Then,



$v_{i,t-1}$ = Wrong-valued price at t-1, $e_{i,t}$ = Unanticipated EPS at t, $r_{i,t}$ = Unexpected returns at t
ERL = Expected Return Line

Left-upper side of the ERL shows the negative $r_{i,t}$ (i.e., lower return than expected), and right-under side of the ERL means the positive $r_{i,t}$ (i.e., higher return than expected). The farther away from the origin to the NW (SE) means the more negative (positive) $r_{i,t}$, i.e., the lower (higher) returns than expected.

- *At the origin (O), $v_{i,t-1}$ = 0 and $e_{i,t}$ = 0, and hence, $r_{i,t}$ = 0.*
- *Point A is on the ERL, which means $r_{i,t}$ = 0, by cancelling out the positive effect of under-valued price by the negative effect of under-performed EPS.*
- *Point B is over the ERL, which means $r_{i,t}$ < 0 (lower returns than expected), by greater negative effect of under-performed EPS than the positive effect of under-valued price.*
- *Point C is under the ERL, which means $r_{i,t}$ > 0 (higher returns than expected), by greater positive effect of over-performed EPS than the negative effect of over-valued price.*

[Figure 1] Price-Earning-Return relationship and expected return line

$$\frac{\partial v_{i,t-1}}{\partial e_{i,t}} = \phi . \tag{9}$$

From the equation (7),

$$r_{i,t} = \gamma + \delta v_{i,t-1} + \lambda e_{i,t} , \tag{7}$$

$$\frac{\partial r_{i,t}}{\partial v_{i,t-1}} = \delta \text{ and } \frac{\partial r_{i,t}}{\partial e_{i,t}} = \lambda \tag{10}$$

From (9) and (10),

$$\phi = \left| \frac{\lambda}{\delta} \right| , \text{ where } | \text{ means absolute value.} \tag{11}$$

ϕ should be positive with δ <0 and λ >0 if $v_{i,t-1}$ and $r_{i,t}$ are negatively related and $e_{i,t}$ and $r_{i,t}$ are positively related.

Substituting (11) into (8) yields

$$\begin{cases} v_{i,t-1} = \left|\frac{\lambda}{\delta}\right| e_{i,t}, (\delta \neq 0) \\ e_{i,t} = 0, (\delta = 0) \end{cases} \quad (12)$$

This (12) represents the ERL.

4. DATA

We use the firms included in the Nasdaq Internet Index (92 firms) for the IF and the firms in the S&P 100 Index (excluding Google) for the TF. The following firms are excluded from the sample;

1) Financial firms.
2) Firms which have different fiscal year from calendar year.
3) Firms which do not have full data from 2003 to 2007. In fact, we perform this research over 4 years from 2004 to 2007, but we need 2003 data for the previous year price and EPS in the model (4) and (7).
4) Firms which show significantly different behaviors from the others[2].

The final number of firms in this research is 38 for the IF, 61 for the TF and hence 99 for total firms, resulting in total 396 observations, 99 firms*4 years = 396 observations.

Data are collected from CompuStat and CRSP (for return). Stock returns are annual return calculated by compounded monthly returns from CRSP, except 2007 returns, which is the first 9 month (Jan. to Sep.) returns from CRSP multiplied by the last quarter (Oct. to Dec.) returns computed by the stock price and dividends from COMPUSTAT. We use the Russell 3000 index for the market return of both IF and TF because both types of firms should be compared by the same standard and the Russell 3000 index tracks almost 99 percent of the stocks included in portfolios of institutional investors.

5. RESULTS

Before running the regression, Panel B in [Table 1] shows that TF, on average, have the higher beginning price, higher EPS in both previous (t-1) and current (t) year, higher SPS in the current year, but lower return in the current year, and these differences are all statistically significant at 1% significance level except returns significant at 5% significance level. Why do internet stocks earn higher returns, despite of lower EPS and SPS, than TF?

[Table 2] shows the regression results for the models (4), (5) and (6), and [Table 3] examines the residuals from the [Table 2]. Panel A in [Table 3] tells that significant differences in the P-E-R exist between IF and TF. The mispricing in the previous year, $v_{i,t-1}$, the unexpected performance, $e_{i,t}$, and unanticipated returns, $r_{i,t}$, tell that, on average, IF are less valued in the previous year by $13.16, worse performed in the current year by $.85 in EPS and more earned by 12.7% in annual return than TF. Therefore, Panel A in [Table 3] explains that the results of Panel B in [Table 1] have the reason.

Panel B in [Table 3] suggests that mispricing in the previous year is negatively, and current EPS is positively, related to the current stock returns. In other words, over (under)-valued stocks in the previous year have lower (higher) returns in the current year, and over (under)-

Panel A: Descriptive statistics

	Variables	N	Minimum	Maximum	Mean	Std. Deviation
All	Pre-P	396	1.190	135.720	33.799	22.436
	Pre-E	396	-21.227	9.819	1.298	2.565
	E	396	-21.227	9.819	1.668	2.604
	S	396	0.282	117.869	22.622	22.756
	R	396	-0.629	3.621	0.197	0.456
	M	396	0.033	0.137	0.078	0.043
IF	Pre-P	152	1.190	135.720	20.573	19.328
	Pre-E	152	-14.624	5.513	0.041	2.130
	E	152	-12.377	5.513	0.367	1.696
	S	152	0.282	55.171	8.076	10.681
	R	152	-0.629	3.621	0.275	0.675
	M	152	0.033	0.137	0.078	0.043
TF	Pre-P	244	7.510	98.580	42.038	20.211
	Pre-E	244	-21.227	9.819	2.081	2.505
	E	244	-21.227	9.819	2.478	2.742
	S	244	3.422	117.869	31.683	23.581
	R	244	-0.451	1.529	0.148	0.220
	M	244	0.033	0.137	0.078	0.043

Panel B: Mean comparison (from the panel A)

Variables	All	IF	TF	t-test for mean equality
Pre-P	33.799	20.573	42.038	*(.000)*
Pre-E	1.298	0.041	2.081	*(.000)*
E	1.668	0.367	2.478	*(.000)*
S	22.622	8.076	31.683	*(.000)*
R	0.197	0.275	0.148	*(.026)*
M	0.078	0.078	0.078	*(1.000)*

p-values in ( )

Pre-=Previous year, P=Price, E=EPS, S=SPS, R=Return and M=Market return

[Table 1] Descriptive statistics and mean comparison

performing stocks in the current year earn more (less) returns, and this is consistent with what we expect from the equation (3). However, there is difference between IF and TF in the P-E-R relations. From the second and third columns of the panel B in [Table 3], only the mispricing in the previous year has a significant effect on the returns for the IF, but both mispricing in the previous year and the current performance have a significant effect for the TF.

Which has more impact on the unexpected returns, between previous mispricing and unanticipated performance? From the panel B in [Table 3], $|\lambda|$ is greater than $|\delta|$, which may mislead to conclude that the unexpected returns, $r_{i,t}$, are more affected by the unanticipated performance, $e_{i,t}$, than the mispricing in the previous year, $v_{i,t-1}$. However, $|v_{i,t-1}|$ is much greater

Model (4): $P_{i,t-1} = a + bE_{i,t-1} + v_{i,t-1}$

Regression	a	28.516 *(.000)*
	b	4.070 *(.000)*
	Adj R^2	.215
Residuals ($v_{i,t-1}$)	Mean	.000
	Min	-28.412
	Max	130.655
	St. Dev.	19.858

Model (5): $E_{i,t} = m + nS_{i,t} + e_{i,t}$

Regression	m	.464 *(.005)*
	n	.053 *(.000)*
	Adj R^2	.214
Residuals ($e_{i,t}$)	Mean	.000
	Min	-23.148
	Max	5.596
	St. Dev.	2.305

Model (6): $R_{i,t} = \alpha + \beta M_t + r_{i,t}$

Regression	α	.082 *(.088)*
	β	1.470 *(.006)*
	Adj R^2	.016
Residuals ($r_{i,t}$)	Mean	.000
	Min	-.8501
	Max	3.338
	St. Dev.	.452

[Table 2] Regressions

Panel A: Group Statistics and t-test for mean equality

	IF	N	Mean	Std. Deviation	Std. Error Mean	t-test for mean equality
$v_{i,t-1}$	1	152	-8.111	19.976	1.620	*(.000)*
	0	244	5.053	18.062	1.156	
$e_{i,t}$	1	152	-0.526	1.910	0.155	*(.000)*
	0	244	0.328	2.468	0.158	
$r_{i,t}$	1	152	0.078	0.669	0.054	*(.025)*
	0	244	-0.049	0.218	0.014	

IF =1: Internet Firms
IF =0: Traditional Firms

Panel B: Regressions: Model (7), $r_{i,t} = \gamma + \delta v_{i,t-1} + \lambda e_{i,t}$

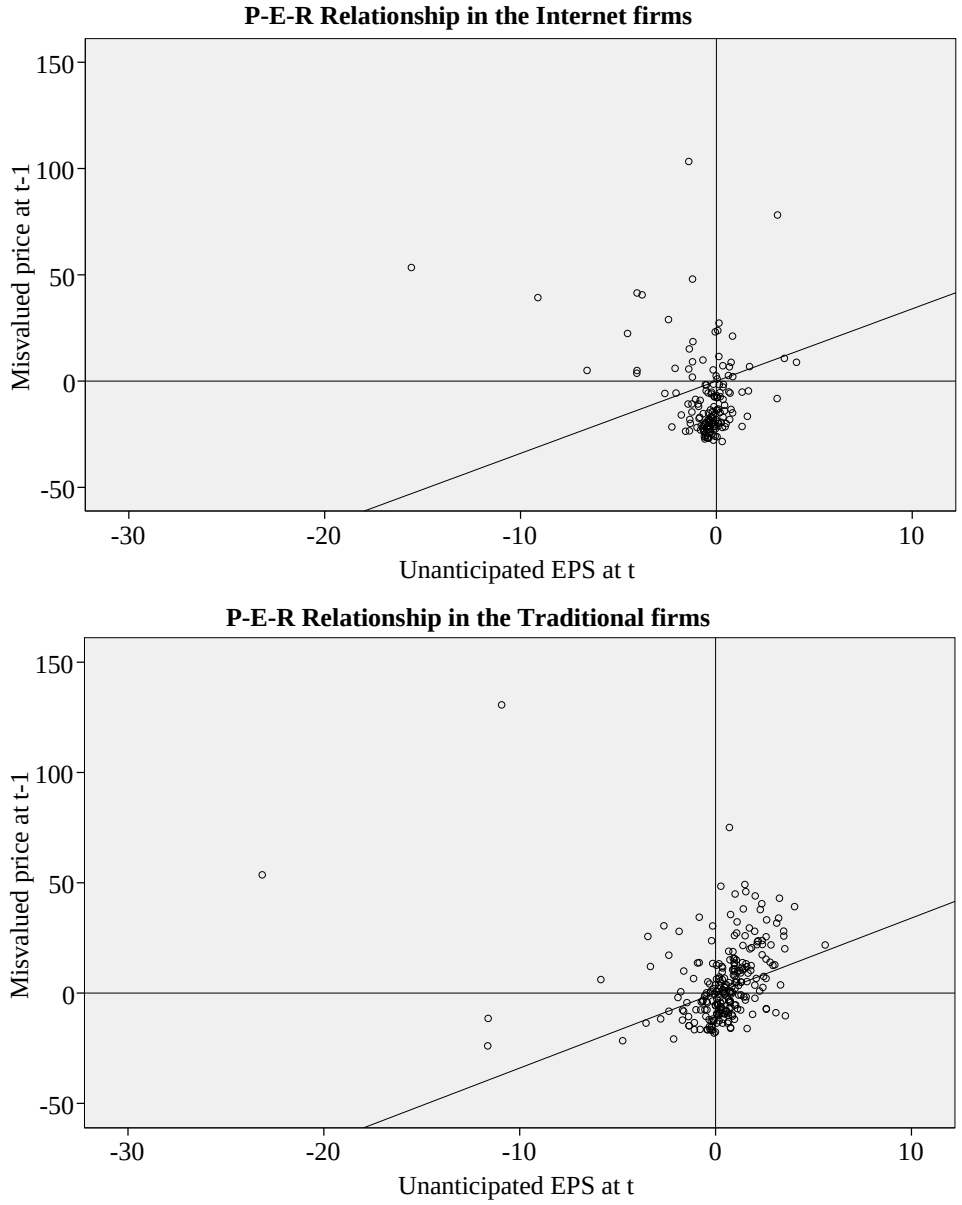
	All	IF	TF
γ	.000 *(1.000)*	.028 *(.647)*	-.046 *(.001)*
δ	-.005 *(.000)*	-.007 *(.012)*	-.002 *(.025)*
λ	.017 *(.086)*	.015 *(.619)*	.019 *(.001)*
Adj R^2	.046	.039	.056

p-values in ( )

[Table 3] Analyses of residuals

than $|e_{i,t}|$ (15 times greater on average, from Panel A in [Table 3]), causing $|\delta_i v_{i,t-1}|$ to be greater than $|\lambda_i e_{i,t}|$, and hence, $v_{i,t-1}$ has greater effect on $r_{i,t}$ than $e_{i,t}$ does. This result supports the Fama-French (1992) and Bae and Kim (1998).

As seen in [Figure 2], for the IF, most firms are under-valued, and the number of under-performed firms is slightly greater than that of over-performed ones, leading most IF to the positive area of unexpected returns (under the ERL). On the other hand, for the TF, over-performed firms outnumber under-performed ones by more than double and over-valued firms



Slope of the ERL = $|\lambda / \delta| = 3.4$ from the first column of Panel B in [Table 3] (See the equation (12))

[Figure 2] Difference in P-E-R Relationship between IF and TF

are a few more than under-valued ones, but they seem to be almost evenly divided by the ERL because the returns are more influenced by the over-valuation than the over-performance.

6. CONCLUSION

We have examined the P-E-R relationship of the firms and analyzed the differences in this relationship between the IF and the TF, analyzing residuals from the regressions. From the results, we find that the stock returns are more affected by the previous mispricing than by the

current performance, supporting the Fama-French (1992) and Bae and Kim (1998), and that the previous mispricing has more effect on the internet stock returns than on the traditional stock returns, and conclude that internet stocks earn higher returns, despite of less earnings, than traditional ones because the internet firms are under-valued in the beginning price compared with the traditional ones.

NOTES

1. The model (6), $R_{i,t} = \alpha + \beta M_t + r_{i,t}$ can be derived from the CAPM (Capital Asset Pricing Model) in the following way. The CAPM says $R_i = RF + \beta_i (M - RF) = (1 - \beta_i) RF + \beta_i M$. If we use β as an average of all β_i, then $R_i = (1 - \beta) RF + \beta M + r_i$, making the model (6) if $(1 - \beta) RF$ is regarded as constant.
2. After collecting all data, we exclude 2 firms from the sample because they show significantly different behaviors from the others: Cogent Communications Group, Inc. (CCOI) and General Motors (GM).

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